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(54) **3D MODEL AND BEACON FOR AUTOMATIC DELIVERY OF GOODS**

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(52) **U.S. Cl.**
CPC ***G06Q 10/08355*** (2013.01); *B64C 19/00* (2013.01); *B64C 2201/128* (2013.01)

(58) **Field of Classification Search**
CPC G06Q 10/00; B64C 10/00; B64C 2201/128
See application file for complete search history.

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Milgram, Judah, et al. "Autonomous Glider Systems for Logistics Delivery." AUVSI (Associated for Unmanned Vehicle Systems International) 2003 Unmanned Systems Symposium and Exposition, Baltimore Convention Center, Baltimore, Maryland. 2003.

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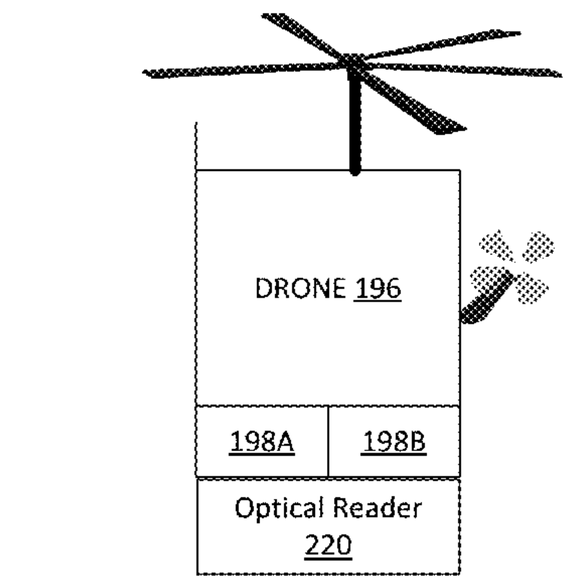
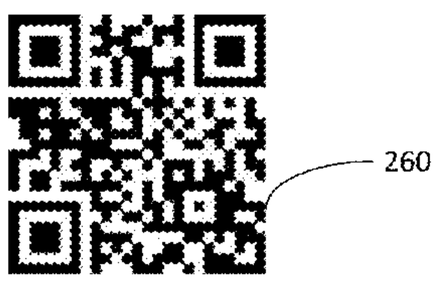
(57) **ABSTRACT**

Methods and apparatus, including computer program products, are provided for drone delivery of products. In one aspect there is provided a method, which may include selecting, at a user equipment, a product; and selecting, by the user equipment, a three-dimensional location where a drone deposits the selected product. Related systems, apparatus, and articles of manufacture are also disclosed.

13 Claims, 7 Drawing Sheets





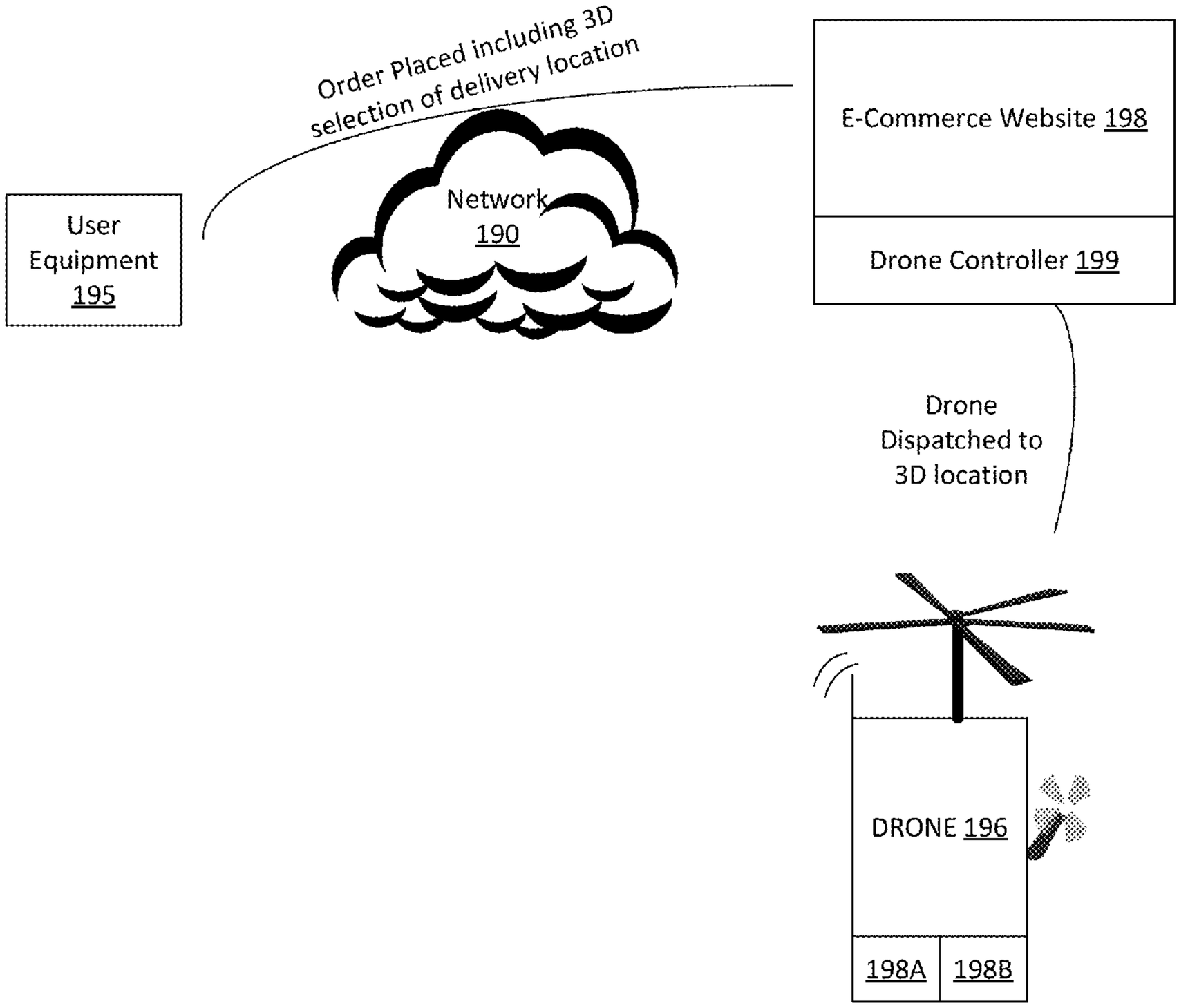

Order Placed including 3D selection of delivery location
User Equipment 195
Network 190
E-Commerce Website 198
Drone Controller 199
Drone Dispatched to 3D location
DRONE 196
198A
198B

FIG. 1

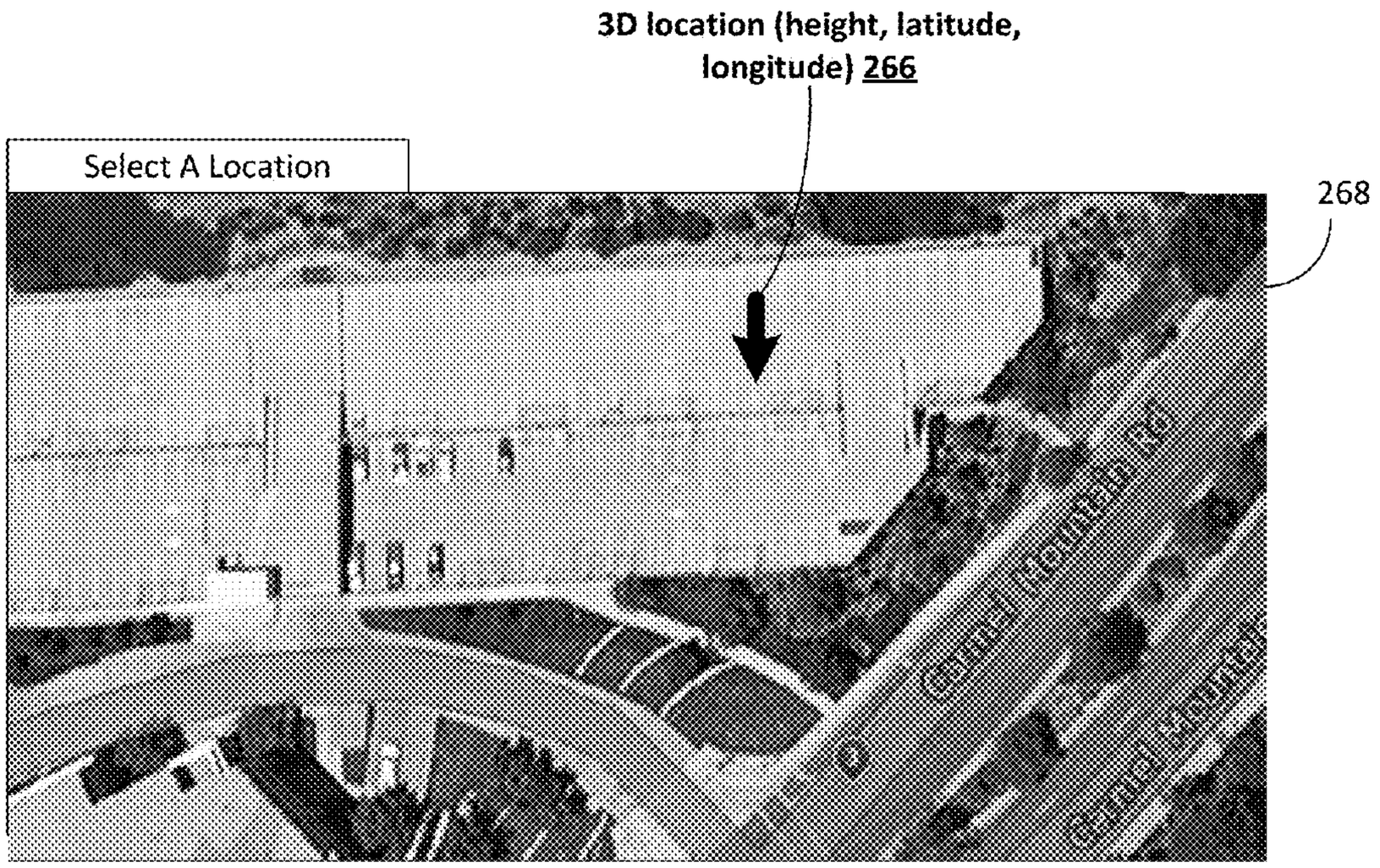

3D location (height, latitude, longitude) 266
Select A Location
268

FIG. 2A

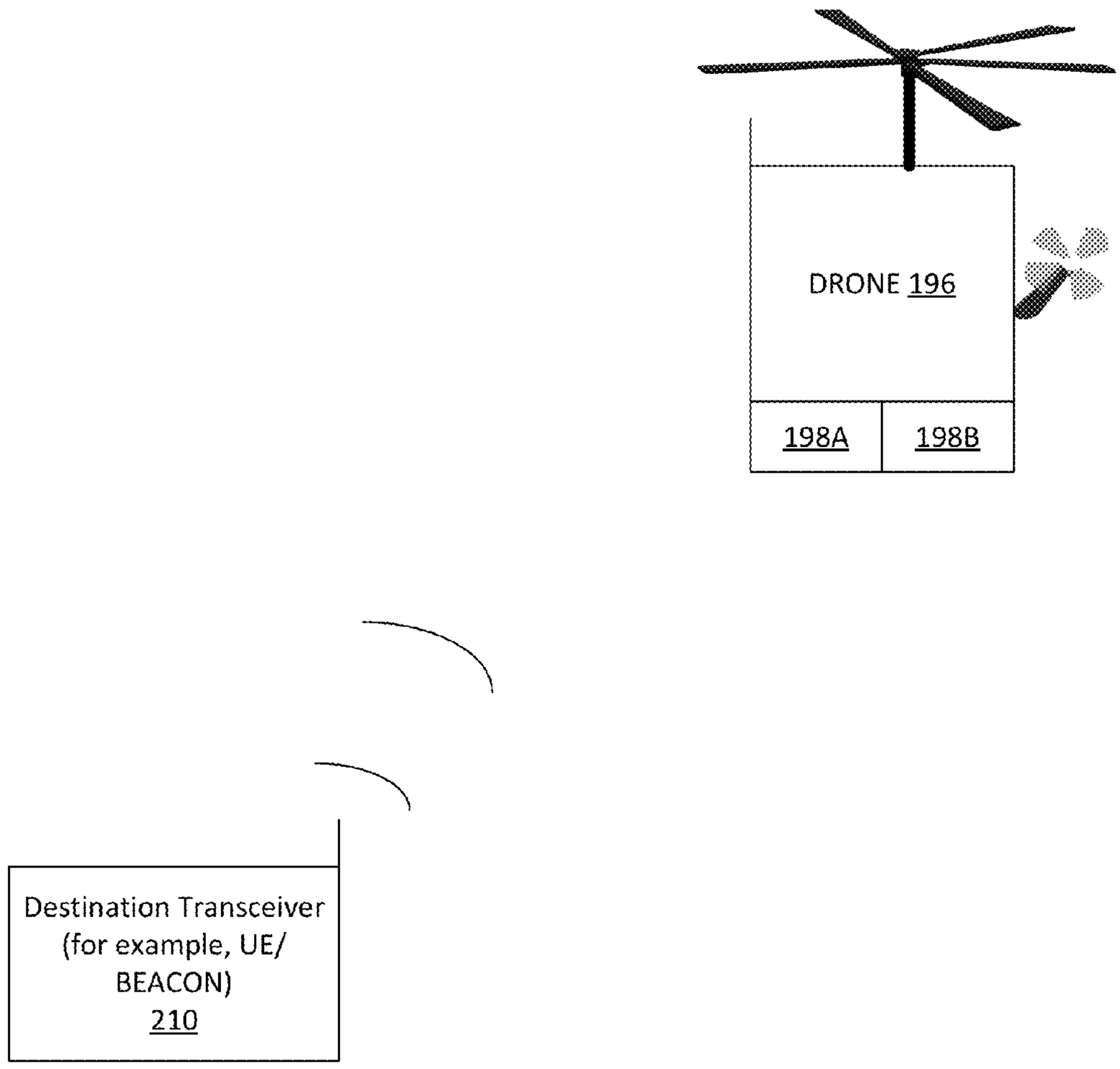
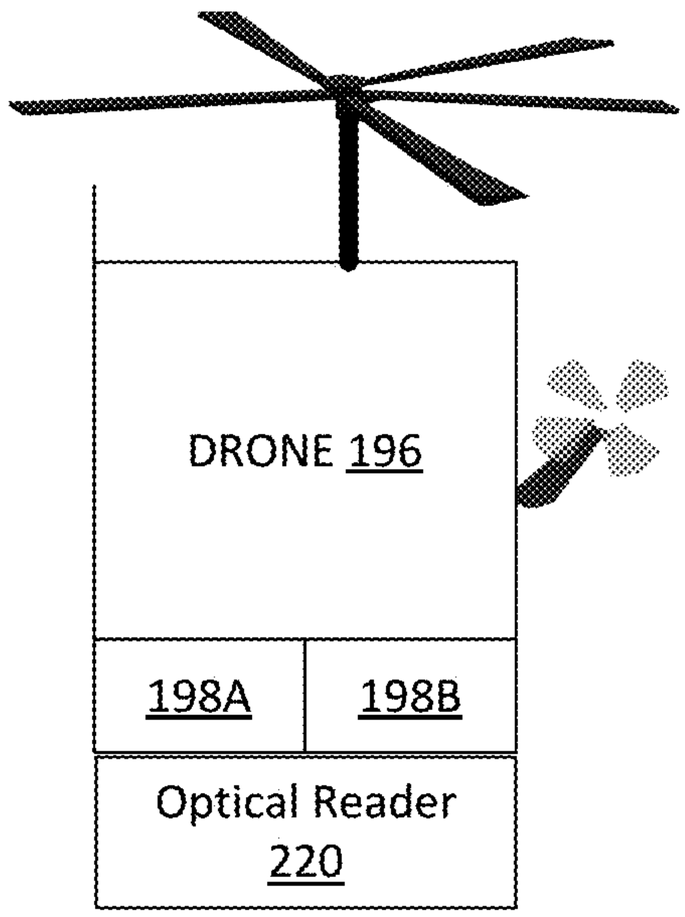

DRONE 196
198A
198B
Destination Transceiver
(for example, UE/
BEACON)
210

FIG. 2B



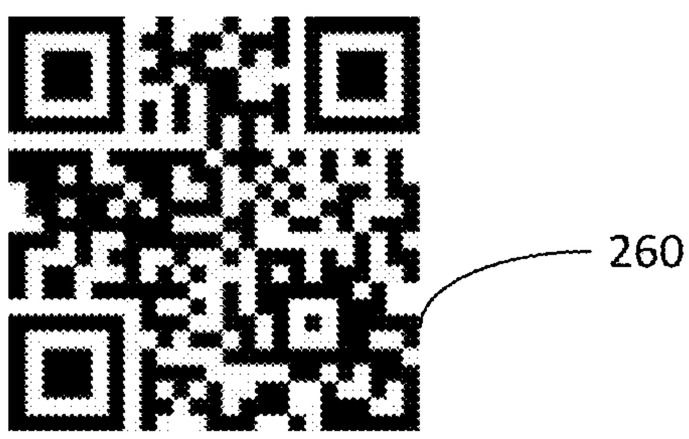


FIG. 2C

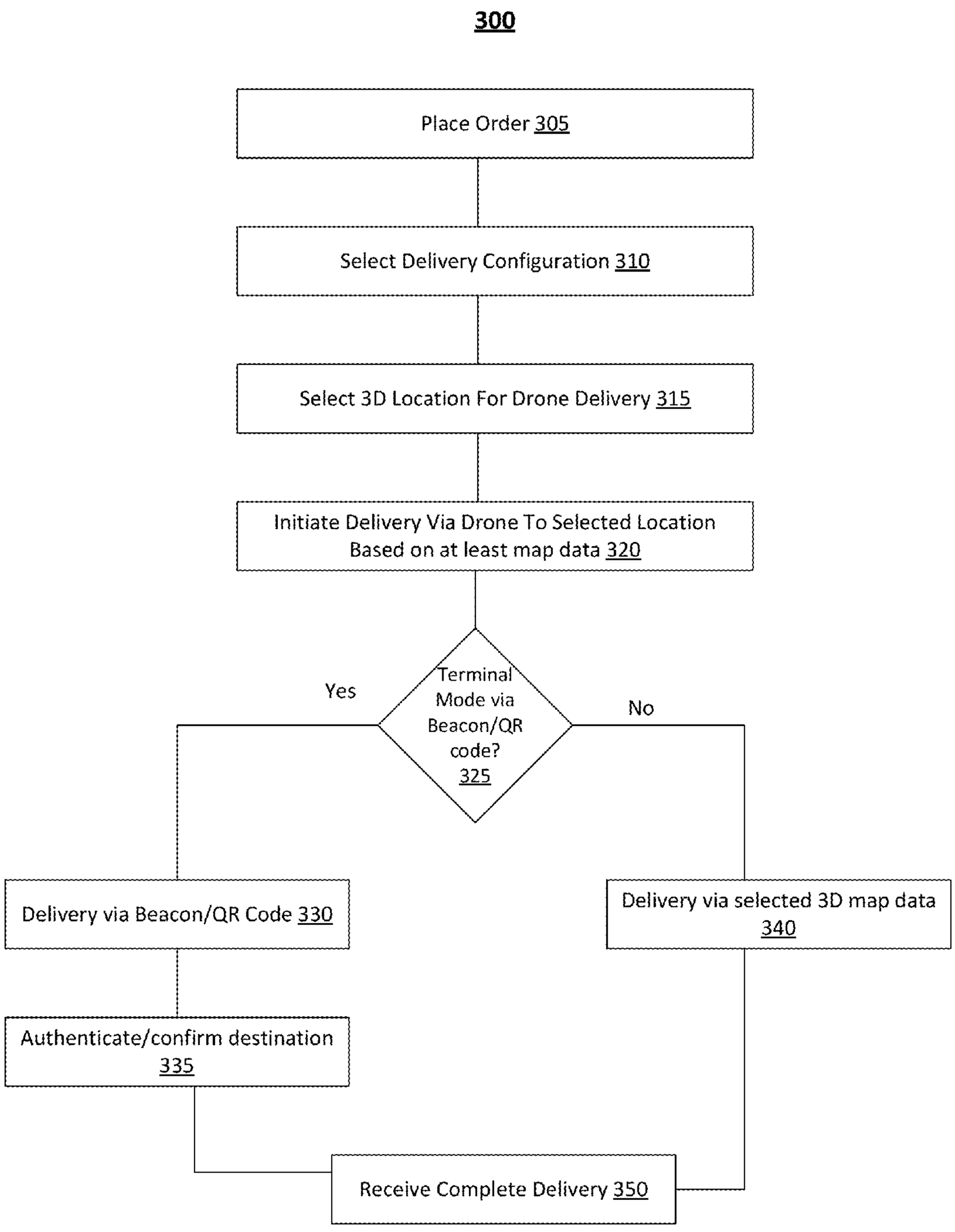

300
Place Order 305
Select Delivery Configuration 310
Select 3D Location For Drone Delivery 315
Initiate Delivery Via Drone To Selected Location Based on at least map data 320
Terminal Mode via Beacon/QR code? 325
Yes
No
Delivery via Beacon/QR Code 330
Delivery via selected 3D map data 340
Authenticate/confirm destination 335
Receive Complete Delivery 350

FIG. 3

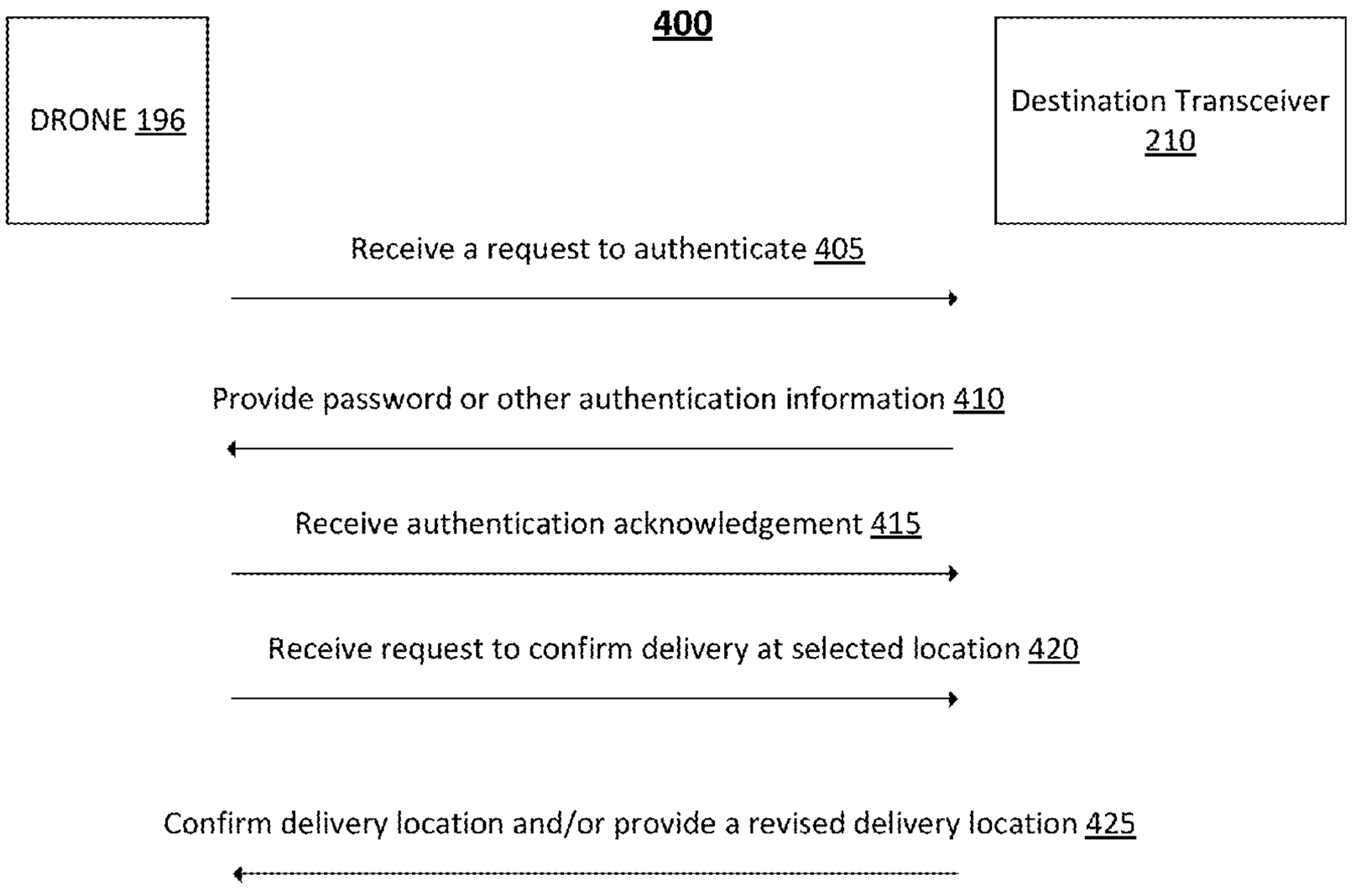

400
DRONE 196
Destination Transceiver 210
Receive a request to authenticate 405
Provide password or other authentication information 410
Receive authentication acknowledgement 415
Receive request to confirm delivery at selected location 420
Confirm delivery location and/or provide a revised delivery location 425

FIG. 4

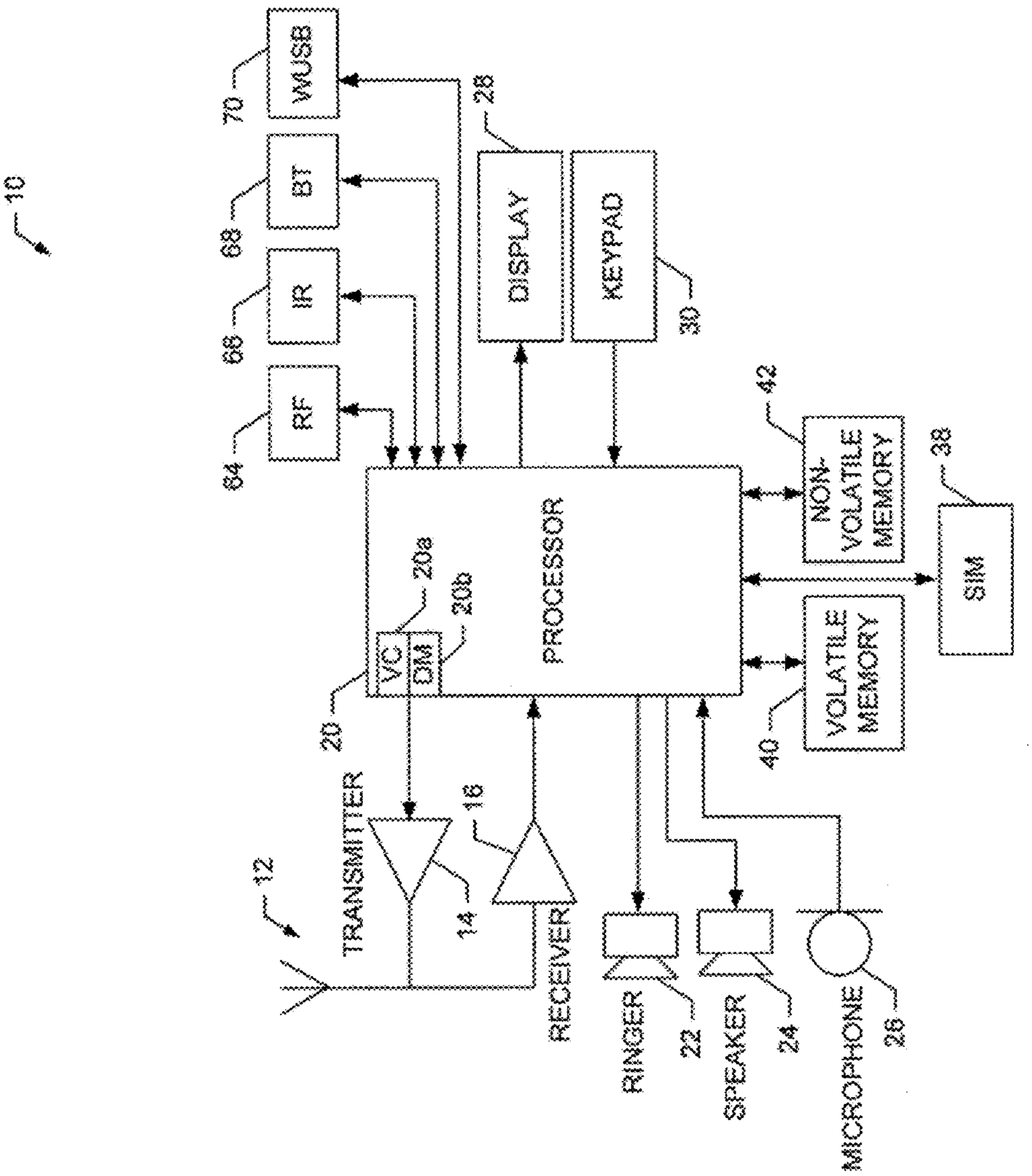

10
12
TRANSMITTER
14
16
RECEIVER
18
20
VC
20a
DM
20b
PROCESSOR
22
RINGER
24
SPEAKER
26
MICROPHONE
28
DISPLAY
30
KEYPAD
32
VOLATILE MEMORY
34
NON-VOLATILE MEMORY
36
SIM
64
RF
68
IR
68
BT
70
WUSB

FIG. 5

3D MODEL AND BEACON FOR AUTOMATIC DELIVERY OF GOODS

FIELD

The subject matter described herein relates to mapping and the delivery of goods.

BACKGROUND

A drone, also referred to as unmanned aerial vehicle, is an aircraft that does not have an onboard pilot. Instead, the drone's flight is controlled by a computer autonomously, by a remote pilot, and/or a combination thereof. In the case of autonomous drones, the drones may use mapping data, on board computers/sensors, and the like to fly in an autonomous or semi-autonomous manner to a destination. The remotely piloted drone may employ a data link to allow a pilot to remotely control the drone's flight.

SUMMARY

Methods and apparatus, including computer program products, are provided for drone delivery of products

In some example embodiments, there is provided a method. The method may include selecting, at a user equipment, a product; and selecting, by the user equipment, a three-dimensional location where a drone deposits the selected product.

In some variations, one or more of the features disclosed herein including the following features can optionally be included in any feasible combination. The three-dimensional location may include a latitude, a longitude, and a height. The three-dimensional location may include a street address and a height. The user equipment may present a map. An indication may be received, and this indication may represent a selection of a location on the presented map. The selected location may be converted to the three-dimensional location where the drone deposits the selected product.

In some example embodiments, there is provided a method. The method may include receiving, at a user equipment, a request to activate a beacon signal to enable a drone to deliver a product to a three-dimensional location; activating, by the user equipment in response to the request, the beacon to enable the drone to home in on the three-dimensional location; receiving, at the user equipment, an authentication request to confirm at least one of an identity of the user equipment or the three-dimensional location where the drone is scheduled to deposit the product; and sending, by the user equipment in response to the authentication request, a message confirming at least one of the identity of the user equipment or the three-dimensional location.

In some variations, one or more of the features disclosed herein including the following features can optionally be included in any feasible combination. The authentication request may be received via a short message service message and a cellular network.

In some example embodiments, there is provided an apparatus. The apparatus comprising means for selecting a product and means for selecting a three-dimensional location where a drone deposits the selected product.

The above-noted aspects and features may be implemented in systems, apparatus, methods, and/or articles depending on the desired configuration. The details of one or more variations of the subject matter described herein are set forth in the accompanying drawings and the description below. Features and advantages of the subject matter described herein will be apparent from the description and drawings, and from the claims.

DESCRIPTION OF THE DRAWINGS

In the drawings,

FIG. **1** depicts an example of a system including a drone for product delivery, in accordance with some example embodiments;

FIG. **2**A depicts an example of a location selected in three-dimensions, in accordance with some example embodiments;

FIGS. **2**B-**2**C depicts an example of a drone delivering a product, in accordance with some example embodiments;

FIG. **3** depicts an example of a process for delivering products via a drone, in accordance with some example embodiments;

FIG. **4** depicts an example of an authentication process for delivering products via a drone, in accordance with some example embodiments; and

FIG. **5** depicts an example of a user equipment, in accordance with some example embodiments.

Like labels are used to refer to same or similar items in the drawings.

DETAILED DESCRIPTION

The delivery of goods to a destination in a timely and efficient way is a vital part of logistics. Specifically, when an order is placed, a purchaser of the good may expect the purchased good to be timely delivered to the right location. Indeed, Internet-based commerce relies on the timely and accurate delivery of goods. With the advent of drones, a drone may be used to automate the logistics associated with goods delivery.

In some example embodiments, the subject matter disclosed herein may allow selection of a delivery location in three dimensions (3D), delivery via a drone to the selected 3D location, and/or an authentication process between the drone and a destination transceiver prior to product delivery by the drone.

FIG. **1** depicts an example system, in accordance with some example embodiments.

User equipment **195** may be used to place a product order via a network **190**, such as the Internet, a cellular network, and/or any other network. This order may be placed at a server, such as an e-commerce website **198** providing an e-commerce virtual storefront. During the order process, user equipment **195** may select a location for the delivery of the ordered product. Moreover, user equipment **195** may be given the option of drone delivery. If this option is selected, the location for delivery may be requested in 3D, in accordance with some example embodiments.

FIG. **2**A depicts an example of a user interface **268** presented at user equipment **195**, in accordance with some example embodiments.

User interface **268** may allow a selection **266** in 3D, in accordance with some example embodiments. In the example of FIG. **2**A, the selected location **266** may have a corresponding latitude, longitude, and height to allow a drone to deliver the ordered good to the location selected at **266**. In this example, the selected 3D location represents a rooftop of a parking garage, although other locations may be selected as well. Once the 3D location is selected, the selected location as viewed via user interface **268** may be converted (for example, using a model that maps the loca-

tion into 3D). For example, the point on the map at **268** may be converted into a height, latitude, and longitude or a street address and height, and the like. Once the location is selected, a drone **196**, referring also to FIG. **1**, may then be dispatched by drone controller **199** to the 3D location selected at **266**.

Although FIG. **2**A depicts a satellite view of the delivery location, other types of maps may be used as well to allow the 3D location selection.

Referring again to FIG. **1**, drone **196** may include one or more bays **198**A-B to contain ordered products. For example, the ordered product for user equipment **195** may be placed in bay **198**A, while bay **198**B may contain a product for another user.

Moreover, in some example embodiments, drone **196** may include a terminal phase. FIG. **2**B depicts an example of drone **196** proceeding to the destination location selected at **266**. At a given distance from the destination, drone **196** may enter a terminal phase and send an indication to a destination transceiver **210**. This destination transceiver **210** may be a user equipment, such as a smartphone, a beacon, an infrared transmitter, an optical transmitter, and/or any other type of radio. For example, when drone **196** is dispatched, drone **196** may navigate from a warehouse to the selected destination **266** using mapping data. When drone **196** is within a certain distance (for example, 100 yards and/or any other distance), drone **196** may send a signal, a page, or a message to activate destination transceiver **210**. In response, destination transceiver **210** may then activate a transmitter, such as a beacon to allow the drone **196** to home in on the transmitted signal and thus the destination location for the product to be delivered. The transmitted signal from transceiver **210** may serve as a beacon at the destination and thus provide location and navigation assistance to the drone's mapping data.

In some example embodiments, the transmitted transceiver **210** signal used as a beacon may be in any portion of the spectrum, such as the radio, optical, infrared (IR), and the like.

Moreover, destination transceiver **210** may operate as a dedicated beacon to provide location assistance to drone **196**. Alternatively or additionally, destination transceiver **210** may be implemented as a more general-purpose transceiver, such as a cell phone, a smartphone, a tablet, and the like. In addition, in the case of a multi-mode wireless device/phone, the drone **196** may activate a radio frequency transceiver, an IR transceiver, and/or any other transceiver at the multi-mode wireless device/phone.

Furthermore, in some example embodiments, drone **196** may seek authentication from destination transceiver **210** before product delivery. For example, as drone **196** approaches the destination indicated by the destination transceiver **210**, drone **196** may request destination transceiver **210** to authenticate itself. This authentication may be a simple password. Alternatively or additionally, the authentication may be implemented using public and private key pairs at the drone **196** and destination transceiver **210**.

When the destination transceiver **210** is implemented as a cellular phone, such as a smartphone and the like, the authentication provided by the cellular system itself may be used. For example, drone **196** and destination transceiver **210** may authenticate via a cellular network/base station (for example, using public keys and private secret keys stored in a subscriber identity module or other secure storage module). When this is the case, drone **196** may send a short message service (SMS) text to destination transceiver **210**, and a response to the request, destination transceiver **210** may respond and thus authenticate the destination transceiver **210**. Moreover, the response by the destination transceiver **210** may also include a password. If the drone **196** determines that the authentication and/or password provided by destination transceiver **210** are correct, the drone **196** may proceed with product delivery at the destination. Although the previous example referred to SMS text, other types of messaging may be used as well.

FIG. **2**C depicts the use of a machine-readable code, in accordance with some example embodiments. For example, drone **196** may include an optical reader, such as a bar code reader **220**, to search for a certain bar code **260** to authenticate the destination location. Once found, drone **196** may deliver the good to the destination location indicated by bar code **260**. To illustrate further, bar code **260** may be printed on a rooftop (such as the rooftop at selected location **266**) to allow drone **196** to deliver the product to the location/bar code **260**. Alternatively or additionally, bar code **260** may be presented by the destination transceiver **210** (for example, on a user interface/display of transceiver **210**).

FIG. **3** depicts an example process **300** for product delivery using drones, in accordance with some example embodiments. The description of process **300** also refers to FIGS. **1**, **2**A, **2**B, and **2**C.

At **305**, an order may be placed for a product, in accordance with some example embodiments. For example, a user may access user equipment, such as a smart phone, a tablet, and/or any other computing device, to place (via a user interface at the user equipment) an order for a product, available via e-commerce website **198**. The order placement may be by an end-consumer placing an order over the Internet, cellular network, or combination thereof. Alternatively or additionally, the order placement may be by a retailer's point-of-sale system to a backend server, such as e-commerce website **199**. As part of the order placement, quantity of goods, payment information, and/or terms of delivery, and any other information may be provided by user equipment **195** to e-commerce website **198**.

At **310**, a delivery configuration may be selected, in accordance with some example embodiments. For example, a user interface at user equipment may be used to provide additional information to the e-commerce website **199** and, in particular, delivery information. In some example embodiments, the user interface at user equipment **195** may allow a selection of whether drone delivery may be used to deliver the ordered product. Moreover, this user interface may also allow a selection of whether the product can be delivered with (or without) authentication and/or delivery confirmation (as described further below at **335**), whether a password is to be used during authentication and/or delivery confirmation, an identity of a beacon transceiver (for example, phone number and any other identifier), and the like.

At **315**, a 3D location may also be selected, in accordance with some example embodiments. For example, the user interface of user equipment **195** may select a delivery location in 3D, in accordance with some example embodiments. Referring to FIG. **2**A, user equipment **268** may present a map at which a selection **266** of 3D location may be performed (for example, by moving a cursor to the desired delivery location). The selected location may then be converted to a 3D delivery location, such as a latitude, a longitude, and a height (or a street address including height).

At **320**, delivery may be initiated via drone to the selected 3D location based on map data and the selected 3D location, in accordance with some example embodiments. For example, the e-commerce website **198** may send the order

information, such as ordered product, 3D delivery location, expected delivery time and the like, to a logistics management system that may include drone controller **199**, which dispatches the ordered product to the 3D location.

When the drone approaches a certain distance to the selected location, the drone may proceed with the delivery based on a beacon and/or machine-readable code, in accordance with some example embodiments (yes at **325**, and **330**). In some example embodiments, delivery may include authentication and/or use of a beacon signal, and these delivery options may be selected by the user interface and/or e-commerce website **198**.

When the beacon is used, drone **196** may, at a certain distance from the destination, enter a terminal phase and send an indication, such as a page, a message, a call, and/or any other indication to destination transceiver **210** depicted at FIG. **2**B. In response, destination transceiver **210** may then activate a transmitter and respond with a beacon signal, a message, a call and/or any other response.

When a machine-readable code is used as shown at FIG. **2**C, drone **196** including an optical reader **220** may scan for bar code **260** to identify and/or authenticate the terminal location as well. The transmitted beacon signal and/or machine-readable/bar may be used by drone **196** (along with mapping and navigation data) to identify and thus home in on the 3D delivery location.

At **335**, an authentication and/or delivery confirmation may be performed, in accordance with some example embodiments. Moreover, the authentication may be performed during the final terminal phase of flight/delivery. Terminal phase may refer to a distance that is within visual or radio line-of-sight, although any other distance may be used as well. For example, the drone **196** may, in some example embodiments, perform when in terminal phase an authentication with the destination transceiver **210** before delivery of the product. The authentication may be performed by a password. For example, the destination transceiver provides a password or code to the drone **196** and/or e-commerce website, although other forms of authentication may be used as well. The password may be carried by the beacon signal transmitted by destination transceiver **210**. The password may be provided in other ways as well including messaging (for example, an SMS text or email to drone **196** and/or any other server).

In some example embodiments, drone **196** and/or e-commerce website may, during the terminal phase of delivery, confirm the delivery location as well. For example, destination transceiver **296** may receive a request to confirm the delivery location. At that time, the destination transceiver **296** may confirm the location or provide an alternate location.

If the drone **196** does not implement a beacon or a machine-readable code, drone **196** may proceed to the destination location based on the selected 3D location, in accordance with some example embodiments (no at **325**, and **340**).

At **350**, a delivery confirmation may be received in accordance with some example embodiments. For example, after the product is delivered, drone **196** and/or e-commerce website **198** may send a confirmation to the entity ordering the product to confirm successful receipt of the ordered product.

FIG. **4** depicts an example process **400** used between the drone and the destination transceiver for authentication, in accordance with some example embodiments.

At **405**, a destination transceiver **405** may receive a request to authenticate, in accordance with some example embodiments. For example, drone **196** and/or another processor, such as e-commerce website, may send a request to the destination transceiver **210** to authenticate. This request may be sent during the terminal phase of flight as the drone approaches the destination transceiver **210**, although the request may be sent at other times as well

At **410**, destination transceiver may authenticate and/or provide a password, in accordance with some example embodiments. For example, destination transceiver **210** may authentication in response to the request. The authentication may be implemented as a code or a password carried by the signal transmitted by the destination transceiver **210**. In some example embodiments, the authentication may be performed via SMS, although other types of messaging may be used as well. Specifically, drone **196** and/or another processor may send a text to the destination transceiver **210**, which responds to the text with a required response in order to authenticate. Alternatively or additionally, other forms of authentication including public-key encryption (for example, using a public key and private/secret keys).

At **415**, the authentication may be acknowledged, in accordance with some example embodiments. For example, the drone **196** and/or another processor may send a message to acknowledge that the destination transceiver **210** is authenticated.

At **420**, the drone may request a final confirmation of the delivery location, in accordance with some example embodiments. For example, drone **196** and/or another processor may, after authentication, send a message to request confirmation of the delivery location at the 3D location. In response to **420**, the destination transceiver **210** may confirm the delivery and the location (or revise the delivery location), in accordance with some example embodiments.

Although process **400** depicts signaling between drone **196** and destination transceiver **210**, one or more of the messages may be between a proxy for the drone and the destination transceiver **210**. For example, in some example embodiments, some of the messages may be routed to another server, such as e-commerce server **198** that responds on behalf of the drone **196**, which may enhance the security of the drone **196** and may reduce possible tampering with, or hacking into, drone **196** by local devices including destination transceiver **210**.

In some example embodiments, an apparatus may be implemented comprising means for performing a method according to at least one of the processes described herein.

In some example embodiments, an apparatus may be implemented comprising means for performing a method according to at least one of the processes shown in FIG. **3** or FIG. **4**.

In some example embodiments, drone **196** may be implemented as a remotely piloted aircraft, although the drone may be a wheeled motor vehicle (for example, a car, truck, and the like) as well. Moreover, drone **196** may include autonomous and/or semi-autonomous (i.e., with some pilot/user intervention) guidance and navigation system to enable flight/movement from a source to the destination location.

FIG. **5** illustrates a block diagram of transceiver **10**, in accordance with some example embodiments. In the example of FIG. **5**, the transceiver **10** (or portions thereof) may be implemented to provide destination transceiver **210** and/or a transceiver at drone **196**. In some example embodiments, the destination transceiver **210** may comprise a user equipment, such as a smart phone, a smart object, a mobile station, a mobile unit, a subscriber station, a wireless terminal, a tablet, a wireless plug-in accessory, and the like.

The apparatus **10** may include at least one antenna **12** in communication with a transmitter **14** and a receiver **16**. Alternatively transmit and receive antennas may be separate.

The apparatus **10** may also include a processor **20** configured to provide signals to and receive signals from the transmitter and receiver, respectively, and to control the functioning of the apparatus. Processor **20** may be configured to control the functioning of the transmitter and receiver by effecting control signaling via electrical leads to the transmitter and receiver. Likewise, processor **20** may be configured to control other elements of apparatus **10** by effecting control signaling via electrical leads connecting processor **20** to the other elements, such as a display or a memory. The processor **20** may, for example, be embodied in a variety of ways including circuitry, at least one processing core, one or more microprocessors with accompanying digital signal processor(s), one or more processor(s) without an accompanying digital signal processor, one or more coprocessors, one or more multi-core processors, one or more controllers, processing circuitry, one or more computers, various other processing elements including integrated circuits (for example, an application specific integrated circuit (ASIC), a field programmable gate array (FPGA), and/or the like), or some combination thereof. Accordingly, although illustrated in FIG. **5** as a single processor, in some example embodiments the processor **20** may comprise a plurality of processors or processing cores.

Signals sent and received by the processor **20** may include signaling information in accordance with an air interface standard of an applicable cellular system, and/or any number of different wireline or wireless networking techniques, comprising but not limited to Wi-Fi, wireless local access network (WLAN) techniques, such as Institute of Electrical and Electronics Engineers (IEEE) 802.11, 802.16, and/or the like. In addition, these signals may include speech data, user generated data, user requested data, and/or the like.

The apparatus **10** may be capable of operating with one or more air interface standards, communication protocols, modulation types, access types, and/or the like. For example, the apparatus **10** and/or a cellular modem therein may be capable of operating in accordance with various first generation (1G) communication protocols, second generation (2G or 2.5G) communication protocols, third-generation (3G) communication protocols, fourth-generation (4G) communication protocols, Internet Protocol Multimedia Subsystem (IMS) communication protocols (for example, session initiation protocol (SIP) and/or the like. For example, the apparatus **10** may be capable of operating in accordance with 2G wireless communication protocols IS-136, Time Division Multiple Access TDMA, Global System for Mobile communications, GSM, IS-95, Code Division Multiple Access, CDMA, and/or the like. In addition, for example, the apparatus **10** may be capable of operating in accordance with 2.5G wireless communication protocols General Packet Radio Service (GPRS), Enhanced Data GSM Environment (EDGE), and/or the like. Further, for example, the apparatus **10** may be capable of operating in accordance with 3G wireless communication protocols, such as Universal Mobile Telecommunications System (UMTS), Code Division Multiple Access 2000 (CDMA2000), Wideband Code Division Multiple Access (WCDMA), Time Division-Synchronous Code Division Multiple Access (TD-SCDMA), and/or the like. The apparatus **10** may be additionally capable of operating in accordance with 3.9G wireless communication protocols, such as Long Term Evolution (LTE), Evolved Universal Terrestrial Radio Access Network (E-UTRAN), and/or the like. Additionally, for example, the apparatus **10** may be capable of operating in accordance with 4G wireless communication protocols, such as LTE Advanced and/or the like as well as similar wireless communication protocols that may be subsequently developed.

It is understood that the processor **20** may include circuitry for implementing audio/video and logic functions of apparatus **10**. For example, the processor **20** may comprise a digital signal processor device, a microprocessor device, an analog-to-digital converter, a digital-to-analog converter, and/or the like. Control and signal processing functions of the apparatus **10** may be allocated between these devices according to their respective capabilities. The processor **20** may additionally comprise an internal voice coder (VC) **20***a*, an internal data modem (DM) **20***b*, and/or the like. Further, the processor **20** may include functionality to operate one or more software programs, which may be stored in memory. In general, processor **20** and stored software instructions may be configured to cause apparatus **10** to perform actions. For example, processor **20** may be capable of operating a connectivity program, such as a web browser. The connectivity program may allow the apparatus **10** to transmit and receive web content, such as location-based content, according to a protocol, such as wireless application protocol, WAP, hypertext transfer protocol, HTTP, and/or the like.

Apparatus **10** may also comprise a user interface including, for example, an earphone or speaker **24**, a ringer **22**, a microphone **26**, a display **28**, a user input interface, and/or the like, which may be operationally coupled to the processor **20**. The display **28** may, as noted above, include a touch sensitive display, where a user may touch and/or gesture to make selections, enter values, and/or the like. The processor **20** may also include user interface circuitry configured to control at least some functions of one or more elements of the user interface, such as the speaker **24**, the ringer **22**, the microphone **26**, the display **28**, and/or the like. The processor **20** and/or user interface circuitry comprising the processor **20** may be configured to control one or more functions of one or more elements of the user interface through computer program instructions, for example, software and/or firmware, stored on a memory accessible to the processor **20**, for example, volatile memory **40**, non-volatile memory **42**, and/or the like. The apparatus **10** may include a battery for powering various circuits related to the mobile terminal, for example, a circuit to provide mechanical vibration as a detectable output. The user input interface may comprise devices allowing the apparatus **20** to receive data, such as a keypad **30** (which can be a virtual keyboard presented on display **28** or an externally coupled keyboard) and/or other input devices.

As shown in FIG. **5**, apparatus **10** may also include one or more mechanisms for sharing and/or obtaining data. For example, the apparatus **10** may include a short-range radio frequency (RF) transceiver and/or interrogator **64**, so data may be shared with and/or obtained from electronic devices in accordance with RF techniques. The apparatus **10** may include other short-range transceivers, such as an infrared (IR) transceiver **66**, a Bluetooth (BT) transceiver **68** operating using Bluetooth wireless technology, a wireless universal serial bus (USB) transceiver **70**, a Bluetooth Low Energy transceiver, a ZigBee transceiver, an ANT transceiver, a cellular device-to-device transceiver, a wireless local area link transceiver, and/or any other short-range radio technology. Apparatus **10** and, in particular, the short-range transceiver may be capable of transmitting data to and/or receiving data from electronic devices within the proximity of the apparatus, such as within 10 meters, for

example. The apparatus **10** including the Wi-Fi or wireless local area networking modem may also be capable of transmitting and/or receiving data from electronic devices according to various wireless networking techniques, including 6LoWpan, Wi-Fi, Wi-Fi low power, WLAN techniques such as IEEE 802.11 techniques, IEEE 802.15 techniques, IEEE 802.16 techniques, and/or the like. In some example embodiments, one or more of the transceivers **64**, **66**, and the like may be used to provide a beacon signal for drone **196**.

The apparatus **10** may comprise memory, such as a subscriber identity module (SIM) **38**, a removable user identity module (R-UIM), an eUICC, an UICC, and/or the like, which may store information elements related to a mobile subscriber. In addition to the SIM, the apparatus **10** may include other removable and/or fixed memory. The apparatus **10** may include volatile memory **40** and/or non-volatile memory **42**. For example, volatile memory **40** may include Random Access Memory (RAM) including dynamic and/or static RAM, on-chip or off-chip cache memory, and/or the like. Non-volatile memory **42**, which may be embedded and/or removable, may include, for example, read-only memory, flash memory, magnetic storage devices, for example, hard disks, floppy disk drives, magnetic tape, optical disc drives and/or media, non-volatile random access memory (NVRAM), and/or the like. Like volatile memory **40**, non-volatile memory **42** may include a cache area for temporary storage of data. At least part of the volatile and/or non-volatile memory may be embedded in processor **20**. The memories may store one or more software programs, instructions, pieces of information, data, and/or the like which may be used by the apparatus for performing destination transceiver functions and/or drone radio functions including processes **300** and/or **400**. The memories may comprise an identifier, such as an international mobile equipment identification (IMEI) code, capable of uniquely identifying apparatus **10**. The functions may include one or more of the operations disclosed with respect to processes **300** and/or **400**.

Some of the embodiments disclosed herein may be implemented in software, hardware, application logic, or a combination of software, hardware, and application logic. The software, application logic, and/or hardware may reside on memory **40**, the control apparatus **20**, or electronic components, for example. In some example embodiment, the application logic, software or an instruction set is maintained on any one of various conventional computer-readable media. In the context of this document, a "computer-readable medium" may be any non-transitory media that can contain, store, communicate, propagate or transport the instructions for use by or in connection with an instruction execution system, apparatus, or device, such as a computer or data processor circuitry, with examples depicted at FIG. **5**, computer-readable medium may comprise a non-transitory computer-readable storage medium that may be any media that can contain or store the instructions for use by or in connection with an instruction execution system, apparatus, or device, such as a computer.

Without in any way limiting the scope, interpretation, or application of the claims appearing below, a technical effect of one or more of the example embodiments disclosed herein is accurate delivery of goods in three-dimensions.

If desired, the different functions discussed herein may be performed in a different order and/or concurrently with each other. Furthermore, if desired, one or more of the above-described functions may be optional or may be combined. Although various aspects of the invention are set out in the independent claims, other aspects of the invention comprise other combinations of features from the described embodiments and/or the dependent claims with the features of the independent claims, and not solely the combinations explicitly set out in the claims. It is also noted herein that while the above describes example embodiments, these descriptions should not be viewed in a limiting sense. Rather, there are several variations and modifications that may be made without departing from the scope of the present invention as defined in the appended claims. Other embodiments may be within the scope of the following claims. The term "based on" includes "based on at least." The use of the phase "such as" means "such as for example" unless otherwise indicated.

What is claimed:

1. A method comprising:

selecting, at a first user equipment, a product;

selecting, by the first user equipment, a three-dimensional location where a drone deposits the selected product; and

initiating delivery of the selected product to the three-dimensional location after receipt of a message indicative of an authentication requiring a machine readable bar code displayed on a second user equipment located at the three-dimensional location where the drone is to deposit the selected product after the bar code displayed on the second user equipment is read.

2. The method of claim **1**, wherein the three-dimensional location further includes a latitude, a longitude, and a height.

3. The method of claim **1**, wherein the three-dimensional location further includes a street address and a height.

4. The method of claim **1**, wherein the selecting the three-dimensional location further comprises:

presenting, at the first user equipment, a map.

5. The method of claim **4** further comprising:

receiving an indication of the selection of the location on the presented map.

6. The method of claim **5** further comprising:

converting the selected location to the three-dimensional location where the drone deposits the selected product.

7. An apparatus, comprising:

at least one processor; and

at least one memory including computer program code, the at least one memory and the computer program code configured to, with the at least one processor, cause the apparatus to at least:

select a product;

select a three-dimensional location where a drone deposits the selected product; and

initiate delivery of the selected product to the three-dimensional location after receipt of a message indicative of an authentication requiring a machine readable bar code displayed on a second user equipment located at the three-dimensional location where the drone is to deposit the selected product after the bar code displayed on the second user equipment is read.

8. The apparatus of claim **7**, wherein the three-dimensional location further includes a latitude, a longitude, and a height.

9. The apparatus of claim **7**, wherein the three-dimensional location further includes a street address and a height.

10. The apparatus of claim **7**, wherein the selection of the three-dimensional location further includes presentation of the map.

11. The apparatus of claim **10**, wherein the apparatus is further configured to at least receive an indication of the selection of the location on the presented map.

12. The apparatus of claim 11, wherein the apparatus is further configured to at least convert the selected location to the three-dimensional location where the drone deposits the selected product.

13. A non-transitory computer-readable medium including computer program code which when executed by at least one processor causes operations comprising:

selecting a product;

selecting a three-dimensional location where a drone deposits the selected product; and

initiating delivery of the selected product to the three-dimensional location after receipt of a message indicative of an authentication requiring a machine readable bar code displayed on a second user equipment located at the three-dimensional location where the drone is to deposit the selected product after the bar code displayed on the second user equipment is read.

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